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Remarks

Thorough examination by the Examiner is noted and appreciated.

The Specification has been amended to correct typographical and grammatical errors.

The claims have been amended and new claims added to clarify Applicants invention.

Support for the amended and new claims is found in the original claims and the Specification.

No new matter has been added.

For example, support for the amendments and new claims are found in the original claims, the Figures, and the Specification at paragraphs 0044 and 0045:

"After the second polishing step is completed, the head rotation unit 14 transfers the wafer 26 from the second polishing pad 28b to the in-line metrology tool 34. As indicated in step S5, at the in-line metrology tool 34,

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the thickness of the material layer 27 is measured. Other parameters, such as film density and sheet resistance (R_s), may also be measured. As shown in Figures 3 and 5, the metrology tool 34 transmits a feedback signal 46, which corresponds to the measured thickness of the material layer 27 or 25, to the process controller 36, in order to adjust the course polish conditions such as polish time, down force, platen/head rotation speed and slurry flow for the successive wafers. Based on the measured thickness of the material layer 27 or 25, as indicated through the feedback signal 46, the process controller 36 calculates the time required to polish the material layer 27 or 25 from the measured thickness to the intermediate target thickness 44, and transmits this information, through an adjustment signal 48, to the first and second polishing pads 28a, 28b, respectively, of the CMP apparatus 10 for the successive wafers to minimize the fine polish variation.

On the other hand, based on the measured thickness of the material layer 27 or 25, as indicated through the feedback signal 46, the process controller 36 calculates the time required to polish the material layer 27 or 25 from the measured thickness to the target thickness 44, and transmits this information, through an adjustment signal 48, to the third polishing pad 28c of the CMP apparatus 10. As indicated in process step S6, the third polishing pad 28c then polishes the material layer 27 from the measured thickness down to the target thickness 44, according to the calculated polishing time transmitted

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through the adjustment signal 48. Finally, the post-CMP thickness of the material layer 27 may then be measured to verify the target thickness before or after cleaning. As indicated in step S7, the wafer 26 may be subjected to a post-CMP cleaning process to remove particles remaining on the wafer 26, prior to continued semiconductor fabrication. This is carried out using the in-situ polish clean tool 50, or alternatively, the ex-situ polish clean tool 51. In the event that the measured post-CMP thickness deviates from the target thickness, the wafer 26 may be re-worked and subjected to another polishing and measuring cycle through the CMP apparatus 10."

Claim Rejections under 35 USC 102

1. Claim 1 stands rejected under 35 USC Section 102(b) as being anticipated by Patel et al. (US 6,623,333).

Patel et al. disclose a process and apparatus including a controller operable to determine a polishing rate of a polishing apparatus (polisher) and to determine polish characteristics of a wafer including a particular device type (see abstract; claims 13-16).

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In the method and apparatus of Patel et al. a **pre-polish thickness measurement is made and a post-polish measurement thickness is made** (see Figure 1; col 1, lines 50-65; col 3, lines 18-43). The method includes a lookahead (calibration) polishing a qualification wafer with a uniform layer of material as well as a product wafer with a device or a particular type (col 3, lines 10 - 31), where **the metrology information is then used to determine a polishing time for an entire lot of wafers** (col 3, lines 36-44). After the lookahead (calibration) process is complete **a remaining portion of the lot is polished for a time determined by the lookahead (calibration) polishing and measuring process**, where again, a pre-polish thickness and a post polish thickness for one or more wafers in the remaining lot portion (col 3, lines 44-57) are carried out to **determine a post-thickness error** (see e.g., col 5, lines 15-25; lines 40-41; col 6, lines 54-55; col 8, lines 53-63; col 9, lines 17 - 31).

Thus, Patel et al. do not disclose several aspects of Applicants disclosed and claimed invention including:
A chemical mechanical polishing apparatus for polishing a layer on a wafer, comprising:

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"a base;

a plurality of polishing heads disposed above said base for engaging the wafer and for sequentially transferring said wafer to a respective plurality of polishing stations in a sequential polishing process;

said plurality of polishing stations comprising respective polishing pads or belts carried by said base, said polishing stations adjacently arranged for **sequentially polishing the layer;**

a metrology tool carried by said base and disposed between a pair of adjacent polishing stations for measuring a thickness of the layer during said sequential polishing process; and

a controller operably connected to said plurality of polishing stations and said metrology tool, said controller operable to adjust polishing conditions at said polishing stations responsive to input from said metrology tool."

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Thus, Patel et al. is insufficient to anticipate Applicants independent and dependent claims.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

"The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claim Rejections under 35 USC 103

2. Claims 2-10 stand rejected under 35 USC Section 103(a) as being unpatentable over Patel et al., above, in view of Zuniga et al. (US 6,422,927).

Applicants reiterate the comments made above with respect to Patel et al.

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On the other hand, Zuniga et al. disclose a polishing apparatus having a plurality of polishing heads with a plurality of polishing pads, as well as loading and unloading stations as Applicants have disclosed as prior art, does not further help Examiner in producing Applicants disclosed and claimed invention or establishing a *prima facie* case of obviousness.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

3. Claims 2-4, 6-8, and 10 stand rejected under 35 USC Section 103(a) as being unpatentable over Patel et al., above, in view of Zuniga et al., above.

Applicants reiterate the comments made above with respect to Patel et al. and Zuniga et al.

Even assuming *arguendo*, a proper motivation for combination,

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such combination does not produce Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

4. Claims 2-4, 6-8, and 10 stand rejected under 35 USC Section 103(a) as being unpatentable over Patel et al., above, in view of Birang (6,540,595).

Applicants reiterate the comments made above with respect to Patel et al.

Even assuming *arguendo*, a proper motivation for combination, the fact that Birang discloses a polishing apparatus having a plurality of polishing heads with a plurality of polishing pads, as well as loading and unloading stations, as Applicants have disclosed as prior art, as well as a linear polishing sheet (belt), does not further help Examiner in producing Applicants

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disclosed and claimed invention or establishing a *prima facie* case of obviousness.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

5. Claims 5 and 9 stand rejected under 35 USC Section 103(a) as being unpatentable over Patel et al., above, in view of Hayashi et al. (6,379,230).

Applicants reiterate the comments made above with respect to Patel et al.

Even assuming *arguendo*, a proper motivation for combination, the fact that Hayashi et al. disclose a polishing apparatus having loading and unloading stations, in combination with Patel et al., does not produce Applicants disclosed and claimed invention and does not further help Examiner in establishing a

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prima facie case of obviousness.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Conclusion

The cited references, either alone or in combination, fail to produce Applicants disclosed and claimed invention and therefore fail to make out a *prima facie* case of obviousness with respect to Applicants independent and dependent claims.

The claims have been amended and new claims added to clarify Applicants disclosed and claimed invention.

Based on the foregoing, Applicants respectfully submit that Applicants Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully


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solicited.

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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